

THE METHODS EMPLOYED IN THE ERADICATING OF AN INFECTIOUS DISEASE IN THE CHINESE QUARTER OF SAN FRANCISCO. *

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HISTORY: On March 6, 1900, the medical and commercial world of California were startled by the announcement that bubonic plague, that most dreaded of oriental diseases, had gained a foothold on our shore, and having a vague idea of its dangers and a still more hazy conception of the extent of the invasion, its progress and the ultimate results thereof, well justified the alarm felt by the Board of Health of San Francisco for the public safety and in the measures then adopted. Plague was known principally as that dread disease that during the seventeenth century depopulated the cities on the Mediterranean and carried off 10,000 in a single day in Constantinople, and was rampant in England and in the north of Europe, being also a scourge in China and northern India at this time. Plague did not make its appearance again to any extent until the occurrence of the epidemic in Hongkong in the year 1894. Literature on this subject, in consequence, was meagre in detail, as well as conflicting and misleading. Experts from various parts of the world had been studying the character of the disease in the Orient, but their conclusions were of little value. To Kitasato and Yersin is due the praise and glory for the discovery and isolation of the bi-polar bacillus of *Pestis Major*, and to Yersin and Haffkine for the preparation of a serum that was to be the curative and prophylactic agency respectively. So great was this feeling of alarm and the exigencies of the case so important in the minds of the Board of Health that for public safety and for the purpose of confining the danger to the district in which it had occurred, namely, Chinatown, it was deemed advisable to quarantine this section, which was accordingly done by the stretching of ropes across the various intersecting streets leading thereto and placing a cordon of police to guard the same. Thus was isolated twelve blocks of the most densely populated and filthiest section of San Francisco.

The original source of infection in San Francisco can at best be only a matter of conjecture or speculation as to the direct carrier responsible for its conveyance to this country and appearance in this city. Owing to the ignorance of the etiology of the disease important data which would aid in establishing this point were at the time overlooked. It had long been styled a "filth disease" and credited with appearing only among those living in and surrounded by the most unhygienic and unsanitary conditions. The rat was considered a carrier of the disease. In recent years this has been more definitely determined by research, experiment and observation to be a fact. Foodstuffs, clothing, merchandise, straw and other substances used as packing, as well as the baggage of Chinese and others arriving from the Orient, were all held in part responsible for its appearance here. The consensus of opinion of those having a most intimate knowledge of the course of the disease in San Francisco is that the rat was the most important factor; that it became infected in some oriental port and was carried by ship to this city, finding its way ashore, transmitting the infection to its fellow rodents, and owing, first, to the proximity of Chinatown to the City Front wharves, and second, to the direct and straight run of the street sewers from this section to the Bay shore, access to same being exceptionally easy, as well as being the true and natural highway of the rat, and, third, to the great amount of refuse, both animal and vegetable, for years collecting in the Chinese quarter, these conditions creating a rich feeding ground and also an ideal place for the further propagation of rats. How conclusive this is can only be ap-

preciated by those who have worked in this quarter and noted the conditions existing in all of the various phases. The role the rat assumes as the carrier and causative factor would seem evident when we view the circumstances that surrounded the first case, a Chinaman living beneath the sidewalk in a mere burrow as it were, at the intersection of Jackson and Dupont streets, which was an extension of the cellar beneath the building known as the Globe Hotel. This space was lined with ordinary rough boards on three sides, the one end being partly closed by the cesspool at the junction of the two streets. In order to have more room, the ground beneath the street surface had been dug out, and a sleeping place arranged by the placing of a few boards over a portion of the side sewer from this cesspool to the main sewer in the street. In this lodging was an accumulation of all kinds of refuse, filth and debris, collected by the occupant, who had lived in this cellar for a number of years. There was a total lack of drainage connections throughout the whole of the building or hotel. This was discovered when the main cellar floor was torn out, and a pool thirty feet wide, sixty feet long and some two feet deep, the result of escaping sewerage caused by a break in the house sewer, was laid bare. This house sewer discharged into this pool instead of being connected to the street sewer, and that portion beyond the break extended through the area walls of the building to the main sewer in the street, being perfectly dry, formed a convenient opening for the entrance of rats. Later on and within half a block of this particular spot, while wrecking a building, eighty-two rats, dead and alive, were gathered, all of which were found to be infected with pest. All these circumstances point to more than a probable source of the mode of infection.

The Quarantine. The death of this patient was reported on March 6, 1900, whereon a meeting of the Board of Health was called, and after deliberation it was decided to quarantine Chinatown, which was done, as already referred to. No person was allowed to enter the quarantined section without a written permit from the health officer, nor were street cars whose lines passed through the district allowed to stop for the purpose of taking on or letting off passengers while en route. A fumigating station was improvised in Portsmouth Square, this being adjacent to the eastern border of Chinatown. All mail and other articles that were deemed necessary to pass out of the district were here disinfected. This quarantine was maintained until 4 p. m. of March 9th, when, no further cases having appeared, and all precautions, such as disinfection of the infected premises, burning of refuse, and filth removed therefrom, it was deemed advisable to raise the quarantine and maintain a daily inspection of the district by a corps of sanitary inspectors and Emergency Hospital physicians. Subsequently cases began to appear in other parts of Chinatown and all efforts to control the spread of the disease appearing futile, the State Board of Health on May 28th officially requested the San Francisco Board of Health to again quarantine this section, which was accordingly done and maintained until June 15, 1900.

Inspection. Owing to the natural antipathy of the Chinese race to any intrusion, as well as their ignorance and the inborn method of transacting personal and public matters by intimidation, bribery and suppression, the "White Devils" were accused of sinister if not ulterior motives. This all tended greatly to impede the work of inspection, and not until the co-operation of educated and influential Chinese, and members composing the Six Companies, was secured, could anything like inspection be properly made. Perhaps the individual inspectors detailed to this work were in part to blame for, as already stated, bubonic plague was an unknown quantity and highly respected for its supposed virulence, and no one was paid to take a chance, such was the general sentiment discreetly voiced. In this connection it

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may perhaps seem to border on the ridiculous when I state that various of these medical gentlemen, all of whom had graduated within the past ten years, protected themselves by wearing little bags containing camphor and asafetida, even after submitting to the prophylactic serum of Haffkine. Such conditions could not and did not long obtain; more light was being shed daily upon the situation. System and order arose to combat the danger. Instead of stalking from house to house with a burly policeman, who pounded upon the door, demanding admission, which, when delayed or refused, resulted in enforced entry by means of ax or sledge, thus admitting the doctor, who entered and peered into the faces of the startled inmates, searched by aid of electric candle or common lantern the dark spaces beneath bunks; making fruitless inquiry for any person who might be sick and walking out after leaving an order, which was seldom understood, to clean the room and whitewash, etc., by the aforementioned co-operation notices were sent in Chinese to every resident in the district to admit and assist the officers and inspectors in the examination of premises and to obey fully all commands given in regard to cleaning of same.

A mass of people numbering more than 10,000, confined within the narrow limits of twelve blocks, many of whom had extensive business interests, not only in Chinatown, but outside the same, as well as the horde on the verge of beggarity, gave forth a powerful cry for liberty and confronted the Board of Health with a demand for food for the indigents. This resulted in arrangements being made with Dr. Kinyoun, the Federal quarantine officer, to remove to Angel Island such as were found needy, and care for them there. During all of the period of the quarantine it was the desire of the Board of Health to immunize, with the Haffkine serum, all residents of the district. Voluntary submission was asked and to thoroughly explain the reasons and facilitate the work a number of interpreters were secured through the Six Companies, who, after witnessing the operation upon the inspectors, agreed to take the injection, perhaps stimulated with the added incentive of obtaining a job at \$2 per day. Equipped with a policeman, interpreter, hypodermic syringe and a one-ounce bottle of Haffkine serum we again made the rounds. The interpreter explained and the prospective subject declaimed, and from the limited number inoculated I cannot but feel that the interpreter spent more time execrating the dose than extolling its virtue. Who knows? I for one did not understand the language, but I do know that the inoculation of the serum left for more than a week a very painful arm. A problem arose in the matter of allowing others than those engaged in sanitary work to enter or leave the district, such as gas and water inspectors, and meter men, postoffice employees, census marshals, and even residents whose business interests were out of the district, this was overcome by inoculating each with the serum, and enforcing individual disinfection at the headquarters opened for this purpose. On May 26, 1900, a restraining order was issued by the Federal Court against this demand of the Board of Health to immunize the Chinese in the district and also Chinese and Japanese coming into and going from this port, and thus the work in this direction ceased.

On or about the above date real inspection began to take form, a corps of plumbing inspectors were detailed to act with the sanitary corps, who were ordered to make a careful house to house inspection. Dirt, debris and garbage were ordered removed from the premises, careful note was made of defects in the plumbing and notice for the renovation of the premises was sent to the owner, who was forced to begin work at once.

A laboratory was opened by the Marine Hospital Service. A bacteriologist, medical and other inspectors detailed thereto, and the order of the local Board of Health made at the inception of the trouble, that

the bodies of all Chinese and Japanese must be autopsied before burial, was here carefully carried out. These medical inspectors, acting in conjunction with like inspectors detailed by the State Board of Health, and working in harmony with the city board, began a systematic census taking, which eventually became so complete and perfect that the inspector on his daily round noted changes of residence, visitors from other parts of the State, or absence of member of the family. On return to headquarters inspectors compared and verified their notes.

Chinese laundries in various parts of the city, and vegetable gardens conducted by Chinese were kept under strict surveillance, owing to the fact that relatives attempted to secrete from the authorities their sick and dead. Steamships and sailing craft from outside ports, as well as local river craft, also passenger trains, were daily inspected for like reasons and for the added safeguard of preventing new cases getting into the State or city. Inspection was daily made of the residential portion of the city contiguous to Chinatown. Such was the inspection daily maintained during the period extending from March 6, 1900, to March 1, 1905. Crude in the beginning by reason of the lack of knowledge of the disease and proper manner of combating, the experience gained by observation of the necessities, all tended to bring about the evolution of that perfect system that marked the closing period of work by the joint boards. During the last year this inspection began to be looked upon with great favor by the Chinese, who had gradually been taught that filth, refuse, darkness and lack of ventilation were their real enemies, and if eliminated greater comfort and better health would be enjoyed. The universal courtesy of the inspectors, the solicitude and zeal displayed while making their rounds, and the positive refusal to be bribed or even tempted when approached, finally won the respect of the Chinamen, and from the aversion and menacing attitude first assumed they cheerfully opened the door each morning and ordered a seat for the doctor. Advice was sought, complaints were made and information volunteered, and a feeling of confidence maintained.

Quarantine and Fumigation. When a case was discovered a quarantine was placed upon the premises by stationing police officers at all points of entry and exit. This was maintained until the patient either recovered or died. Then the house would be treated in the following manner: The premises and all furniture therein were thoroughly fumigated with sulphur. Walls, ceilings and floors sprayed with 5% carbolic acid solution. The basement, cellar or area beneath the building, surrounding ground and woodwork were covered with chloride of lime. The premises remained thus for five days, when the infected rooms were opened and all clothing, furniture, interior decorations, paper from the walls and ceilings, if loose, were removed to the street and there incinerated. The premises were again sulphured and kept closed for another five days, during which time the owner was notified that before any further occupancy of the place could prevail all lath and plaster of the rooms and hallways must be removed, and the frames thus exposed must be whitewashed and then covered with new lath and plaster material. In no instance was exception made to this rule. If the owner failed to comply the premises remained vacated.

The dead were removed to the laboratory of the Marine Hospital and after an autopsy the body was sealed in a heavy zinc lined coffin; before sealing, the body was covered with unslacked lime. Burial took place immediately.

Sanitation of the District. This work was a separate feature and for convenience may be divided into three headings:

First. Removal of refuse, garbage and accumulated debris:

The disposal of the above in Chinatown had been

done in a manner most convenient to them, with no consideration for health or ultimate results that might accrue from its collection. "Out of sight out of mind" is a phrase that would apply aptly to the case. Pits were dug beneath wooden floors of cellars, covered with loose boards or a trap door, spaces between floors, especially in area ways, were the universal receptacles. Prior to the wrecking of additions to the original structures nearly all cooking was done in the wooden covered porches. The crevices and lightshaft between buildings were in many instances filled to the height of the top story. In this manner a large percentage of refuse was also disposed of, and only when the mass threatened to bury the tenants, or one faction was filling the space faster than his neighbor, was complaint made and the hiding place pointed out. From the above description you must not infer that the sanitary officers were negligent in allowing such a state of affairs to exist. Constant vigilance had been exercised and many arrests made among the offenders, but it was simply impossible to discover these conditions, owing to the construction of the buildings and the additions thereto. The occurrence of plague, however, led to rigid inspection for the purposes of controlling the situation and bettering the sanitation, which was made possible by the special corps detailed to the district. Owners and tenants were at once put to work to remove this debris, but the progress made was too slow, and the demand for prompt and energetic action so great that a force of laborers were employed to go from house to house in the entire district, tear up floors where necessary and carry the refuse to the street; from here it was removed to a vacant lot in the section and there incinerated. After thoroughly cleaning the district arrangements were made with the Six Companies, who now provide a number of scavenger wagons for the purpose of removing the garbage of the Chinese residents, thus bringing about a revolution of the former system.

Second. Flushing of streets and sewers and disinfection of premises, and killing of rats:

Almost from the inception of the disease men were detailed each day to flush and clean the main and tributary sewers located in this section. They also spread poisoned fish, prepared at the laboratory, in these sewers for the purpose of killing rats. During the height of the epidemic in 1901 a Kinyoun sulphur apparatus was employed to disinfect the sewers by forcing sulphur fumes into them. This was done by the stopping of all cesspool openings, tributary sewers and manhole covers in the block by tightly sealing them with clay and the sewer then filled with sulphur fumes under pressure. This had the twofold effect of acting as a disinfecting agent and killing many rats. After some months this was discontinued, other and better measures taking its place.

To destroy the rat has been our constant aim. At the present day, after fourteen months of immunity, every rodent caught alive or found dead is carefully autopsied, smears and cultures are made. We no longer poison this pest, for under the most careful handling phosphorus, arsenic and strychnine are dangerous agents. We now use Danysz virus, pure cultures of which are obtained, a pepton bouillon is inoculated and thickened with cornmeal, thus forming a tempting morsel for rats and mice, as well as a perfectly harmless mixture for man or the higher animals. The epizootic-like disease that results in rats and mice after eating of this mixture is very fatal. The advantage in the use of this is that it is perfectly clean, aside from being harmless. It can be placed on closet shelves and in other places in kitchens, where food is sought by the rodent. Under this subdivision I have included the disinfection of premises, which for two years past has been done as follows: The spreading of chloride of lime over all exposed surfaces in cellars, alleyways, areaways, toilets and on the floor of such houses where cases had occurred. This was alternated by spraying with

a 5% solution of carbolic acid and a 1-500 solution of bichloride of mercury were interchanged. Latterly the bichloride was exclusively used, owing to the frequent complaint and objection to carbolic acid. These sprays were used principally to kill fleas and other vermin that find a natural breeding place in the cracks and crevices of floors and walls, and also for the purpose of cleanliness and disinfection. The streets of this district were swept three times a week and were sprinkled each day. All asphalt streets were hosed off each morning before flushing the sewers. During 1903, when the greatest number of cases occurred, the streets were sprinkled with a 1-500 bichloride each day.

Third. Delicate as is the plague organism it appeared to resist all measures, showing conclusively that the nidus had not been reached. To burn the district was impracticable and not warranted; experience had taught us that in those places having the most light and air we seldom found infection or rats. From this arose the idea of restoring the buildings to their original area walls by the tearing out of all wooden additions, balconies and other structures that excluded light and ventilation. Nothing was allowed to be reconstructed except a small balcony not over five feet square, and this only where it was found necessary to carry a toilet or urinal. The value of this course soon became manifest and led to the tearing out of all wooden floors in cellars and compelling the owner of the property to replace the same with artificial stone and cement. The problem seemed solved, as cases diminished from the outset of this procedure and as the work continued they ceased entirely.

Chinatown now has a solid stone floor over its entire area of twelve blocks. The areaways, lightwells and spaces between buildings are likewise free of all obstructions, in fact, the section has undergone such a change that it may be compared favorably with any district in the city and the only persons still complaining are the pests known as Chinatown guides, whose vocation is gone, there being no more underground dens with reeking filth and grimy denizens to squeeze a gullible tourist a \$1 a head to view. Owing to the length of this paper I am unable to cover the conditions met while in charge of the work of wrecking the areaways and cellars, but I assure you that mere words, no matter how expressive, would fail to paint the picture. This was not accomplished without the expenditure of much labor and money on the part of the State, city and property owners. In the early part of the work the Citizens' Relief Committee raised \$30,000 to assist the city authorities in the sanitary measures then outlined. I have estimated that more than \$500,000 was spent by property owners in rehabilitating their premises. The city authorities expended, approximately, \$45,000, aside from the amount spent by the State authorities.

Results. They were the eradication of the most virulent of diseases and a knowledge gained of the proper methods to apply. San Francisco has accomplished what no other city similarly infected ever did. Perhaps the class of structures the authorities had to deal with were responsible for the methods employed, as the chief object was not to wreck the buildings, but to exterminate the disease.

The Federal, State and city authorities who have had charge of this work can feel a just pride in the solution of a sanitary problem, accomplished by the removing of various impediments and surmounting of serious obstacles.

The vomiting of appendicitis is not a constant factor. It is of useful diagnostic value when present. The presence of general peritonitis is pretty surely indicated by a green vomitus, while in a less severe form of the disease the vomitus is of the ordinary contents of the stomach.—*Harvey, in Journal of the Medical Society of New Jersey.*